REMARKS

Claims 3-16 and 27-28 are pending of which Claims 3-6, 9-16, 27 and 28 were rejected and Claims 7 and 8 were allowed. Claim 27 has been amended.

The specification has been amended to include a US Patent number. No new matter has been added.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

Drawings

The Examiner stated that the proposed drawings were mentioned in the Amendment filed June 13, 2002, but no proposed drawings were enclosed. Applicants did attach the proposed drawings, but nevertheless, will retransmit the proposed drawings as an attachment hereto with changes shown in red pursuant to MPEP §608.02(r).

Formal drawings will be filed upon the Examiner's acceptance of the proposed drawing changes.

Claim Rejections – 35 U.S.C. §103

Claims 3, 5, 9, 10, 13, and 15

Claims 3, 5, 9, 10, 13, and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Rosencwaig et al (US 5,596,406) ("Rosencwaig") in view of Ledger (US 5,555,474) ("Ledger"), Lochbihler et al. ("Characterization of highly conducting wire gratings using an electromagnetic theory of diffraction") ("Lochbihler"), and Raymond et al. ("Resist and etched line profile characterization using scatterometry") ("Raymond"). In addition, it appears that the Examiner intended to reject Claim 14, but failed to specifically discuss Claim 14 or state that Claim 14 is rejected. Clarification on this is requested.

Claims 3 and 13 recite "at least one of said polarizing element and said sample are rotatable to produce a relative rotation between said polarizing element and said diffracting structure" and "a spectrograph that detects the intensity of spectral components of said reflected radiation after passing through said polarizing element at a plurality of polarization orientations between said polarizing element and said diffracting structure".

The Examiner cited Rosencwaig as showing an apparatus that includes "at least one of a polarizing element and sample rotatable (col. 10, lines 7-20) ... and a spectrograph with a

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dispersing element (col. 7, lines 38-44) that detects the intensity at a plurality of polarization orientations (Fig. 2, #64, and col. 9, lines 31-35).

Rosencwaig, however, at col. 9, lines 31-35 states that to derive "both S and P information would ... take a second measurement after filter 60 and the dispersion element 62 have been rotated by ninety degrees as indicated by arrow B in Fig. 2." Thus, Rosencwaig teaches that the filter 60 and dispersion element 62 are rotated, not the polarizing element. Accordingly, contrary to the Examiner's statement, Rosencwaig fails to teach or suggest rotating "at least one of said polarizing element and said sample" and a "spectrograph that detects the intensity of spectral components ... at a plurality of polarization orientations between said polarizing element and said diffracting structure".

The Examiner further cited Rosencwaig as showing an apparatus that includes "a rotating polarizing element with radiation passing through a polarizing element toward a sample (Fig. 2, #122)" and "reflected radiation passing through a rotating polarizing element (col. 2, #132)". Claims 3 and 13, however, include limitations that the incident light and reflected light pass through the same polarizing element, i.e., "said reflected radiation passing through said polarizing element".

The Examiner stated that it would have been obvious to combine the polarizing elements #122 and #132 of Rosencwaig. The Examiner's motivation to combine the two polarizing elements #122 and #132 is that

> To have the reflected radiation pass through the said polarizing element, one having only routine skill in the art would have found it obvious to form in one piece an article, which has formerly been formed in two pieces and put together. One would be motivated to integrate the polarizers together to save space and make the device smaller for convenience.

Office Action, page 4. Applicants respectfully disagree and assert that the Examiner is engaging in hindsight reconstruction.

Rosencwaig teaches that when his system is operating as an ellipsometer, a polarizer 122 is used along with an analyzing section 132. Col. 10, lines 7-20. As is well known in the art, in conventional ellipsometry, the polarizer 122 and the analyzing section 132 do not always have the same angles between the transmission axis and the angle of incidence. In other words, the polarizer 122 and analyzing section 132 are physically separate and independent devices. By way of example, Rosencwaig cites U.S. Pat. No. 5,042,951 (the '951) as discussing ellipsometric analyses, which is instructive. See, Col. 10, lines 18-20 of

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Rosencwaig. The '951 discusses the use of a separate polarizer section 36 and analyzer section 48, stating that

> In a null ellipsometer configuration, the function of the polarization section and analyzing section is to introduce equal and opposite phase shifts to those caused by the reflection at the sample surface. By properly adjusting the components, the light reaching detector 50 can be minimized. Information about the position of the elements in the polarizing section and the analyzing section are supplied to a processor 52 for calculation of sample parameters by the methods used in the prior art.

Col. 7, lines 3-12 of the '951. Thus, the polarizer 122 and analyzing section 132 are physically distinct and separately operable articles. Accordingly, contrary to the Examiner's statement, it not simply "routine skill" to use a single polarizing element in place of two separate polarizing elements which, conventionally, use different transmission axis angles.

Moreover, the Examiner's statement that it would be "obvious to form in one piece an article, which has formerly been formed in two pieces and put together" is not on point. Generally, the cases that hold that making integral is obvious, such as In re Larson, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA, 19665), relate to replacing two or more components that are rigidly fixed together with a single integral component. See, e.g., MPEP § 2144.04(V)(B). The polarizer 122 and analyzing section 132 of Rosencwaig were not "put together", but are physically separate and distinct components, each operating independently of the other.

Further, while the Examiner stated that the motivation would be to save space and make the device smaller, this begs the question: why would one of ordinary skill in the art choose the polarizer 122 and analyzing section 132 of Rosencwaig to combine together into a single element to save space? Applicants respectfully submit that the Examiner is using the Applicants claimed invention as a template in a hindsight based rejection.

The Examiner also stated that Rosencwaig teaches that "[t]he method is repeated when the apparatus is used again." While this statement is unclear, Applicants believe the Examiner is referring to element (e) and (f) in Claim 13, and will respond accordingly. Elements (e) and (f) in Claim 13 state

> (e) producing a relative rotation between said polarizing element and said diffracting structure to alter the orientation of said polarized element relative to said diffracting structure and repeating steps a through d;

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(f) repeating step e for a plurality of orientations of said polarizing element and said diffracting structure;

The Examiner has failed to show where Rosencwaig teaches or suggests either step (e) or (f) in Claim 13. Moreover, the Examiner has failed to show where Rosencwaig teaches element g, which states "using said detected intensities of said spectral components of said output beam for a plurality of orientations to determine said at least one parameter of said diffracting structure." Accordingly, a prima facie case of obviousness has not been met.

In addition, Applicants' note that the Examiner's rejection is based on a large number of references, which the Examiner believes is obvious to combine. Applicants respectfully remind the Examiner that the question under 35 U.S.C. §103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 218 USPQ 871 (Fed. Cir. 1983), and see MPEP §2141.02. It is improper to "engage in a hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps." In re Gorman, 933 F.2d 982, 977, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991) *citing* Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985).

The Examiner stated that it would be obvious to combine Rosencwaig with the processor 28a of Ledger. The Examiner stated that combining Rosencwaig with Ledger is obvious because "[o]ne would be motivated to use a computer system with at least one computer and program for a user-friendly system to analyze data and have user interfaces." Office Action, page 3. Applicants respectfully submit that the stated motivation is not supported by the specification of either Rosencwaig or Ledger, as neither appears to discuss the need for a "user-friendly system to analyze data and have user interfaces". The Examiner is respectfully referred to In re Lee, 277 F.3d 1338, 61 USPQ2d 1430 (Fed. Cir. 2002), in which a similar "user-friendly" statement of motivation was rejected by the Federal Circuit.

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The Examiner also stated that it would be obvious "to have best [sic, curve] fitting of Lochbihler et al with the suggested apparatus of Rosencwaig et al., since one would be motivated to compare the measurements to standards and insure the proper parameters as implied from Lochbihler et al . (Page 236, 3.2 Comparison to measurements, first 3

paragraphs)." Office Action, page 4. Applicants respectfully submit that the motivation to combine Lochbihler with Rosencwaig is inadequate and that the Examiner is engaging in impermissible hindsight reconstruction of Applicants' claimed invention. See, In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988) (One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.)

The Rosencwaig reference is related to the measurement of thin film (col. 1, lines 13-14), while Lochbihler is related to the reconstruction of the cross section of a wire grating (Abstract). The embodiment of Rosencwaig that the Examiner has cited, i.e., with the polarizer 122 and analyzing section 132, operates as an ellipsometer. As is well known in the art, ellipsometers measure a film and based on the measurement derive ellipsometric parameters ψ and Δ from which the thickness of the measured film may be determined. See, e.g., the '951 patent (col. 2, lines 23-58). The apparatus disclosed in Rosencwaig, thus, is used to directly calculate the thickness of the film being measured. Accordingly, there is no reason that Rosencwaig would use curve fitting as disclosed in Lochbihler, which is attempting to fit theoretical and experimental data. Applicants submit that the motivation to "compare the measurements to standards and insure the proper parameters" is nonsensical when applied to Rosencwaig and is inadequate to make a prima facie case of obviousness. For example, to what "standards" would Rosencwaig try to compare its measurements and what "proper parameters" would Rosencwaig try to insure? Moreover, using Lochbihler's curve fitting to fit theoretical and experimental data with Rosencwaig would not satisfy these motivations.

The Examiner also stated that it would have been obvious "to have the optical model of Raymond et al. with the suggested apparatus of Rosencwaig et al., since one would be motivated to check the measurement results of a sample set with a standard to check for good edge acuity as shown by Raymond et al. (Page 480, second paragraph)." Office Action, page 4. Applicants respectfully submit that the motivation to combine Raymond with Rosencwaig is inadequate and that the Examiner is again engaging in impermissible hindsight reconstruction of Applicants' claimed invention. See, In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988) (One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.)

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As discussed above, Rosencwaig relates to the measurement of thin films. Raymond, on the other hand, relates to determining the cross section of a line (Abstract, and Title). The apparatus disclosed in Rosencwaig is used to directly calculate the thickness of the film being measured. Accordingly, there is no reason that Rosencwaig would use modeling as disclosed in Raymond. The motivation of "check[ing] the measurement results of a sample set with a standard to check for good edge acuity" are nonsensical with respect to Rosencwaig. For example, why would Rosencwaig be interested in checking for "good edge acuity" when Rosencwaig measures film thickness?

Accordingly, Applicants submit that for at least the reasons stated above, independent Claims 3 and 13 are allowable. Claims 5, 9 and 10 depend from Claim 3 and Claims 14 and 15 depend from Claim 13, and thus, Claims 5, 9, 10, 14 and 15 are allowable for at least the same reasons as Claims 3 and 13. Reconsideration and withdrawal of the rejection is respectfully requested.

Claim 4

Claim 4 was rejected under 35 U.S.C. §103(a) as being unpatentable over Rosencwaig in view of Ledger, Lochbihler, and Raymond as applied to Claim 3, and further in view of Green et al. (US 5,956,145) ("Green"). Green was cited as teaching non-linear regression.

Claim 4 depends from Claim 3, and thus is allowable for at least the same reasons as Claim 3. Green does not remedy the defects of the Rosencwaig, Ledger, Lochbihler, and Raymond combination discussed above.

Accordingly, Applicants respectfully submit that Claim 4 is allowable and request reconsideration and withdrawal of the above rejection.

Claim 6

Claim 6 was rejected under 35 U.S.C. §103(a) as being unpatentable over Rosencwaig in view of Ledger, Lochbihler, and Raymond as applied to Claim 3, and further in view of Naqvi et all. ("Scatterometry and the Simulation of Diffraction Based Metrology") ("Naqvi"). Naqvi was cited as disclosing rigorous coupled-wave analysis.

Claim 6 depends from Claim 3, and thus is allowable for at least the same reasons as Claim 3. Naqvi does not remedy the defects of the Rosencwaig, Ledger, Lochbihler, and Raymond combination discussed above.

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In addition, Applicants respectfully submit that Examiner's expressed motivation to combine Rosencwaig, Ledger, Lochbihler, and Raymond with Naqvi is inadequate and based on hindsight. The Examiner stated that it would be obvious to make the combine the rigorous coupled-wave analysis of Naqvi with Rosencwaig, Ledger, Lochbihler, and Raymond because "it has proved particularly useful for gratings having a continuously varying refractive index as shown by Naqvi et al. (Page 6, col. 2, third paragraph)." Office Action, Page 6.

As discussed above, Rosencwaig is a thin film measurement tool. Naqvi, on the other hand, is related to the cross section of gratings. The expressed motivation that rigorous coupled-wave analysis "has proved particularly useful for gratings" is irrelevant to the device disclosed in Rosencwaig. Thus, the Examiner has failed to provide an adequate motivation to combine these five references.

Accordingly, Applicants respectfully submit that Claim 4 is allowable and request reconsideration and withdrawal of the above rejection.

Claims 11, 12, 27, and 28

Claims 11, 12, 27, and 28 were rejected under 35 U.S.C. §103(a) as being unpatentable over Kuni et al. (US 4,647,196) ("Kuni") in view of Rosencwaig.

The Examiner stated that Kuni discloses radiation "passing through a polarizing element (Fig. 10, #70)". Applicants believe the Examiner is referring to item #72 in Fig. 10, as element # 70 is the beam of light. However, item # 72 is actually a quarter wavelength plate, not a polarizer. Col. 6, lines 10-13. Kuni discloses that to reduce noise, a polarizer 71 (before beamsplitter 67) and a separate analyzer 73 (after beamsplitter 67) may be used with the quarter wavelength plate 72 (between the beamsplitter 67 and sample 4). There is no suggestion in Kuni to combine the physically separate and independent polarizers 71 and 73 into a single polarizer.

While neither Kuni nor Rosencwaig teach or suggest that "said reflected radiation passing through said polarizing element" as recited in Claims 11 and 12, the Examiner stated that it would be obvious to modify Kuni to combine the two polarizers into a single polarizer. The Examiner's statement of motivation is the same for Rosencwaig discussed above, i.e., it is obvious "to form in one piece an article, which has formerly been formed in two pieces and put together" and that one "would be motivated to integrate the polarizers to save space and make the device smaller for convenience." Similar to what was discussed above, the polarizers 71 and 73 (along with quarter wavelength plate 72) are physically separate and

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distinct articles disclosed by Kuni. Applicants respectfully assert that it is not simply routine skill to combine separate and distinct devices into a single element as the Examiner suggests. Moreover, there is no suggestion or motivation provided in Kuni to combine polarizers 71 and 73 (along with quarter wavelength plate 72) into a single element.

While the Examiner stated that the motivation would be to save space and make the device smaller, this begs the question: why would one of ordinary skill in the art choose polarizer 71, polarizer 73 in Kuni to combine together into a single element, particularly when Kuni describes a quarter wavelength plate 72 being used in conjunction with the polarizers 71 and 72. Applicants respectfully submit that the Examiner is using the Applicants claimed invention as a template in a hindsight based rejection.

The Examiner noted that Kuni does not specifically disclose a rotatable polarizer or a "a spectrograph that detects a plurality of polarization orientations." Office Action, page 6. Rosencwaig is then cited as teaching a rotatable polarizer and a spectrograph. Applicants respectfully traverse.

Claims 11 and 12 recite "at least one of said polarizing element and said sample are rotatable to produce a relative rotation between said polarizing element and said diffracting structure" and "a spectrograph that detects the intensity of spectral components of said reflected radiation after passing through said polarizing element at a plurality of polarization orientations between said polarizing element and said diffracting structure". Rosencwaig, on the other hand, states that to derive "both S and P information would ... take a second measurement after filter 60 and the dispersion element 62 have been rotated by ninety degrees as indicated by arrow B in Fig. 2." Col. 9, lines 31-35. Thus, Rosencwaig teaches that the filter 60 and dispersion element 62 are rotated, not the polarizing element. Accordingly, neither Rosencwaig nor Kuni teach or suggest rotating "at least one of said polarizing element and said sample" and a "spectrograph that detects the intensity of spectral components ... at a plurality of polarization orientations between said polarizing element and said diffracting structure".

Claim 27 has been amended to recite "a spectrograph that detects the intensity of spectral components of normally incident radiation reflected off said diffracting structure" to clarify that only the normally incident radiation is detected by the spectrograph. As recognized by the Examiner, Rosencwaig uses a multiple angles of incidence. Moreover, Kuni does not use broad band light, nor does it use a spectrograph.

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The Examiner stated that it would have been obvious "to have the broadband radiation to illuminate a spectrograph of Rosencwaig et al., with the device of Kuni et al., since one would be motivated to use this technique for simultaneous multiple angle of incidences and wavelengths for measurement in interferometric devices as suggested by Rosencwaig et al. (col. 4, lines 29-40). Rosencwaig at col. 4, lines 29-40, states that the "advances discussed herein can be used on both interferometric and ellipsometric devices." The Examiner, however, cited Rosencwaig specifically for its ellipsometric system which includes a rotatable polarizer. Office Action, page 6, and see Rosencwaig at col. 10, lines 7-9. Rosencwaig's interferometric device does not include a rotatable polarizer. Thus, one would not be motivated to combine Rosencwaig's ellipsometric system with Kuni for "measurement in interferometric devices".

In addition, Kuni specifically teaches that the incident beam is collimated, i.e., the "substantially parallel beam having a small diameter ... is applied to the examination object 4." Col. 5, lines 65-67. Thus, one of ordinary skill in the art would not be motivated to deviate from this express teaching of Kuni to use "simultaneous multiple angle of incidences and wavelengths for measurement in interferometric devices" from Rosencwaig as suggested by the Examiner.

Accordingly, Applicants respectfully submit that Claims 11, 12, 27 and 28 (as being dependent on Claim 27) are allowable for at least the above reasons and request reconsideration and withdrawal of the above rejection.

Claim 16

Claim 16 was rejected under 35 U.S.C. §103(a) as being unpatentable over Rosencwaig in view of Ledger, Lochbihler, and Raymond, as applied to Claim 13 above, and further in view of Kuni.

Claim 16 depends from Claim 13, and thus is allowable for at least the same reasons as Claim 13. Kuni does not remedy the defects of the Rosencwaig, Ledger, Lochbihler, and Raymond combination discussed above. Accordingly, Applicants respectfully submit that Claim 16 is allowable and request reconsideration and withdrawal of the above rejection.

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Claim 27 has been amended and Claims 3-16 and 27-28 are pending. For the above reasons, Applicants respectfully request allowance of Claims 3-16 and 27-28. Should the

Examiner have any questions concerning this response, the Examiner is invited to call the undersigned at (408) 982-8200, ext. 2.

Via Express Mail Label No.

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Version with markings to show changes made

In the Claims

Claim 27 is amended as follows.

27. (Amended) An apparatus for measuring one or more parameters of a diffracting structure on a sample, said apparatus comprising:

a radiation source that emits broadband radiation, said radiation is normally incident on said diffracting structure;

a polarizing element in the beam path of said broadband radiation;

an r-θ sample stage for holding said sample with said diffracting structure; and

a spectrograph that detects the intensity of spectral components of normally incident radiation reflected off said diffracting structure.

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